intensity formulas more generally give the equation of an envelope curve embracing maximum intensities of all storms, rather than the intensity-duration relation of a single storm.—*H. R. L.*

The author evidently confuses storm with cloud in some degree. His first formula, $i=\frac{h}{t}$, is true of course of the total amount of precipitation in a storm where t is the total time, but the derivation of the basic formula for maximum rain intensity in a time interval t, given and used by the author, viz, that $\Delta=\frac{h}{\sqrt{t}}$, certainly does not follow from it. That is a form of expression sometimes used, especially in Europe, for relative rain intensities of equal frequency in storms of short duration. Of the hundred or more rain intensity formulas which have been published in the United States only a few take this form. More commonly an expression of the type $i=\frac{a}{b+t}$ fits the data better. My own preference is for a formula of the exhaustion type, $i=a\ e^{-kt^n}$. In each of the above formulas the intensity is finite, i. e., $\frac{a}{b}$ or a, for $t=0$; whereas the intensity formula used by the author gives an infinite intensity or precipitation rate for zero time, which is certainly incorrect. Nevertheless, the author's formula can be used to approximately or roughly represent rain intensity-time relations in short storms most anywhere, and so far as that feature of the paper is concerned he gives some data which have not hitherto appeared in English.

There is a suggestion of something very much more important in this paper; *that is, the proposition that there is for each locality a maximum or limiting value of nature's capabilities in the way of rain production,* but of course it has nothing whatever to do with the size of or amount of moisture in any cloud. Strangely enough, engineers invariably recognize the existence of this maximum but since no way seems hitherto to have been devised to determine its value, the majority of rain intensity and flood formulas are in such form that the existence of the maximum is not taken into account. I do not think the author's method of arriving at this so-called maximum value of Δ is satisfactory. Even if the Brückner cycle was much more perfect than it generally is, even then one cycle differs from another in magnitude of its maximum and minimum points to a considerable degree. There is, therefore, no certainty that the absolute maximum rain intensity for any interval may not somewhat exceed, though probably not much, any value observed, even in two Brückner cycles. I happen to have been studying this question of limiting or maximum possible rainfall rates very carefully. I fully believe in the existence of maximum values, as the author suggests, but I furthermore believe (and have worked them out to test my theory for many cases) that a frequency formula for various intensities can be devised in which the constants determined from the more frequent and better known observations will lead to a curve having an asymptote, the position of which is the limiting value of rainfall for the given duration, and this position can be determined.

Within the past few weeks Mr. Leach has been working out these limiting values of annual rainfall in this way for several of the longer New England rainfall records. In general the indicated maximum annual rainfall so determined is slightly, but sometimes only slightly, in excess of any value ever observed. Nearly all the records used cover seventy years or more.

To some extent the natural maximum limitations of rainfall, say for a single storm, can, I think, be approximated from meteorological conditions, although I have approached the subject entirely from a statistical viewpoint. In consideration of the importance of the subject, and the fact that I do not think there is a word in relation to it in print anywhere, a symposium on this very question—*Is there a limiting maximum amount of rain which nature can produce at each locality in any chosen time interval; and if so, how may this limit best be determined?*—would, I think, be fruitful of valuable results.

Gorbatchev's paper could be used in digest or abstract form to introduce such a discussion. It occurs to me that Bjerknes' Theory of the Cyclone, especially in relation to the formation of rain, points the way roughly to an analysis of the meteorological conditions which limit the possible amount of rain which can be produced at a given place during the passage of a cyclonic storm.—*R. E. H.*

CITY PLANNING AND THE PREVAILING WINDS.

CLARENCE J. ROOT, Meteorologist.

[Weather Bureau Office, Springfield, Ill., July 17, 1923.]

Much interest has been manifested during recent years in the city planning and zoning movement. The planning of cities is hardly a modern idea. As long ago as 1789 Maj. Pierre Charles L'Enfant, an engineer officer who had served with our troops in the Revolution, was commissioned to lay out a capital city for the young Nation. Washington to-day is an example of the advantages to be had in planning the future of our cities. Most of our cities were not planned, but just grew, and efforts are now being made to rectify the mistakes of the past and to plan for the future.

The city of Springfield, Ill., is about to adopt a city plan. The experts have completed the surveys and have submitted the tentative plan. This contemplates for the future city, among other things, a union railroad station, an industrial district, the creation of a large lake in the valley of the Sangamon River, and a civic center. The civic center is to be a memorial to Abraham Lincoln, and will occupy several blocks grouped about the Lincoln homestead. It is planned to have a wide boulevard lead from the union station, through the Lincoln civic center, to the State capitol building, and thence to the Lincoln tomb in Oak Ridge Cemetery.

In locating the industrial zone, Mr. Myron H. West, who supervised the work, placed it in the extreme northeast part of the city. Consideration was given to the source of water supply, proximity to coal mines and to railroads and terminals, housing conditions, and available sites for industrial plants. The matter of prevailing wind direction was an important factor, however, in choosing this location. The idea is to so locate industries that the smoke, gases, and noises will not be wafted over the city.

An examination of the 44-year weather record at the Springfield station discloses the fact that the prevailing wind direction is from the northwest during January

and February and from the south during all the other months. By months, the relation that the prevailing wind bears to the entire wind movement, expressed in percentages, is as follows: January, 52; February, 70; March, 43; April, 45; May, 70; June, 50; July, 41; August, 39; September, 73; October, 68; November, 43; December, 43. The following statement shows the second most frequent direction, where it is at all close to the prevailing: January, south; March, northwest; June, southwest; July, southwest; November, northwest; December, northwest.

A study of the diagram clearly indicates that the wind from any of the directions from which it usually blows will carry the smoke from the industrial zone out into the country, and that the smoke-bearing winds will blow over the city during but a small part of the time.

In discussing this subject Mr. West made the following statement:

> It is obvious that it is greatly to be desired that the residential sections of the city be to the windward rather than to the leeward of a large factory district, especially where the use of soft coal is prevalent. Even though electric energy be used to a large extent in such a factory district, there are always odors and noise emanating from such a factory district, which tend to make homes to the leeward thereof undesirable. A case in point is the large area of Chicago to the leeward of the stock yards. Unquestionably millions of dollars have been lost to property owners whose property has been affected by this condition.
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> Some years ago we got out a plan for La Salle, Ill. The Illinois Zinc Co. had its plant on the river bank, and directly to the north on the hills lies the major portion of the residential section. The gases and smoke from this plant resulted in killing trees and shrubs along the streets and on private grounds. In another portion of the city trees and shrubs in a cemetery located to the leeward of a large cement plant have been seriously injured by dust and gases. In working out the industrial district in this case, we were careful to place it on plateau land well to the northeast where, fortunately, we were able to secure other requisites, such as belt line connection with railroads, fairly level land and adequate water supply.
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> In the plan for Shreveport, La., we were compelled on account of local conditions to place the future factory district to the south of the city. We were careful, however, to zone the city in such a way as to force the better residential sections out of the path of the prevailing winds.

Some cities are not so fortunately situated in this respect as is Springfield. It is obvious that where a large body of water lies to the leeward of a city, preferred location for its industrial district can not be arranged. In the case of Chicago the prevailing winds are from the southwest during January, February, July, September, October, and December, and west in November. It will be noted that the winter months, when the smoke is probably the worst, are included in the southwest group of months. The prevailing wind is northeast during March, April, May, June, and August. The best residence sections have the advantage during these months.[1] A table showing the frequency of monthly prevailing wind direction at Chicago gives southwest 35 per cent of the total, and northeast 23 per cent. The large industrial plants at South Chicago and Gary are fortunately located. Because of the curvature of the shore line of Lake Michigan these plants are so situated that the smoke largely blows either to the southwest over open country or to the northeast far out over the lake and away from the city. The smoke from the west side manufacturing districts and railroad yards moves over the business center and north shore suburbs during the greater part of the year. This could only be avoided by locating these districts in what is now the best residence section of the city, the lake preventing the establishment of a manufacturing zone to the northeast of the business and residential sections.

At Milwaukee the prevailing wind is northeast during April, May, June, and August, but west and southwest throughout the remainder of the year. Here again the lake prevents the locating of smoke-producing industries in the most favorable place. The plants south of the business center and near the lake meet the situation fairly well. The trend of the shore line at Cleveland is largely northeast-southwest, and the lake offers no interference to the ideal placing of smoke producing industries. The prevailing winds are from the southwest during January, February, November, and December, west in March and April, and southeast from May to October, inclusive. With plants located in the extreme northeast part of Cleveland, the winds from any of the above mentioned directions would carry the smoke away from the entire city.

As planning and zoning projects are taken up in the various cities of the country consideration must be given to the matter of wind direction, and Weather Bureau officials will no doubt be asked to cooperate with the engineers in furnishing the desired information.

[1] Cox and Armington: The weather and climate of Chicago.

STIMULUS AND CONSERVATION OF ENERGY AS BASES OF MEDICAL CLIMATOLOGY.

By FRANZ BAUR, PH. D.

[Wetter-und Sonnenwarte, St. Blasien, Germany, April, 1923.]

SYNOPSIS.

The effect of stimuli on the natural defensive processes of the human body and conservation of its stock of energy, are the starting points from which medical climatology must develop, and which the latter has to deduce from observations of the physical condition of the atmosphere from clear comparative records. To do this it is necessary that all observations should relate to special physical properties of man, as well as his place of residence and personal habits, and that the description of climate hitherto customary, by giving only mean and extreme values, should give place to a description based on values intensities of stimulating power and of cooling power, and their respective durations.

It has been frequently pointed out, in recent times, both by medical men and meteorologists, that the method hitherto adopted of applying meteorological data to medical purposes is of little practical use. The deficiency is due partly to the different attitudes adopted by the professional meteorologist and the physician towards physical conditions of the atmosphere, and partly to the course of development of medical science during the last century. In both respects we seem to have reached a turning point. Medical climatology is about to give itself an independent position between meteorology and medical science, and to separate from the province of meteorology as a whole, those questions and results of research which are of especial importance to the physician.

A change has already become apparent in medical science, in serology and the therapeutics of proteins. For decades the chief objective of medical science was the complete understanding of the cause of diseases and the healing of the injured part of the body by means of specially adapted remedies, the so-called *specific* therapeutics. With medical science working on these lines, it was naturally only with difficulty that the completely unspecific *Climatotherapeutics* could be brought into line. Since, however, the value of increasing the energy